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Amendments to the Claims:

This listing of claims will replace all prior versions, and listings of claims in the application:

Listing of Claims:

1-16. (Canceled)

1　　　17.　　(Previously presented): A method for processing data in a storage system
2　coupled to a host computer via a network, the method comprising:
3　　　　producing snapshots of a data volume, including a first snapshot of at least a
4　portion of the data volume for a first point in time and a second snapshot of the portion of the
5　data volume for a second point in time, wherein the first point in time is represented by first
6　information that specifies a time when the first snapshot is taken and the second point in time is
7　represented by second information that specifies a time when the second snapshot is taken;
8　　　　detecting write requests directed to the data volume and in response thereto
9　producing journal entries corresponding to the write requests, wherein at least one of the journal
10　entries can be applied to one of the snapshots to recreate data of the portion of the data volume,
11　wherein the journal entries includes write data associated with the write requests and time
12　ordering information that specifies order of the write requests made to the data volume;
13　　　　detecting a marker request and in response thereto producing a marker journal
14　entry that specifies a third point in time between the first point in time and the second point in
15　time, wherein the journal entries and the marker journal entry are ordered according to a time
16　when one of the write requests is conducted and the third point in time;
17　　　　detecting a request to retrieve the marker journal entry that specifies the third
18　point in time between the first point in time and the second point in time and in response thereto
19　accessing the marker journal entry; and
20　　　　detecting a request to perform a recovery operation, the request including the third
21　point in time associated with the marker journal entry, and in response thereto:

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22   selecting one of the first or second snapshot based on the first information,

23   the second information, and the third point in time; and

24   selecting at least one of the journal entries corresponding to the write

25   operation conducted between the third point in time and one of the first or second point in

26   time associated with the selected snapshot based on one of the first or second information

27   associated with the selected snapshot, the time ordering information and the third point in

28   time to recover data of the portion of the data volume at the third point in time by using

29   the selected snapshot and the selected at least one of the journal entries.

        18-30. (Canceled)

1   31.   (Currently amended): A storage system coupled to a host computer via a

2   network comprising:

3   a data volume storing write data from the host computer;

4   a snapshot storing area storing a first snapshot of at least a portion of the data

5   volume for a first point in time, the first point in time represented by first information that

6   specifies a time when the first snapshot is taken, the snapshot storing area further storing a

7   second snapshot of the portion of the data volume for a second point in time, the second point in

8   time represented by second information that specifies a time when the second snapshot is taken;

9   a journal storing area storing journal entries, wherein the journal entries comprises

10   the write data and time ordering information that specifies order of write operations made to the

11   data volume, and storing marker information that specifies a third point in time between the first

12   point in time and the second point in time; and

13   a storage controller configured to perform write operations according to write

14   requests received from the host computer, to manage snapshot operations to store a plurality of

15   snapshots including the first snapshot and the second snapshot, and to manage journal operations

16   to record the journal entries and record the marker information based on an instruction from the

17   host computer;

18   wherein the first information, the second information, and the maker information

19   are associated with the time ordering information to specify time ordering among a time when

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PAGE 5/10 * RCVD AT 3/28/2006 6:15:10 PM [Eastern Standard Time] * SVR:USPTO-EFXRF-6/43 * DNIS:2738300 * CSID:6503262422 * DURATION (mm-ss):02-48

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Reply to Office Action of December 15, 2005

20   one of the write operations is conducted, the first point in time, the second point in time, and the

21   third point in time,

22   wherein the storage controller releases at least one of the stored journal entries,

23   wherein, in response to receiving a data recovery request that includes the marker

24   information between the first point in time and the second point in time, the storage controller

25   determines if at least one of the journal entries is stored in the journal storing area to perform the

26   data recovery request,

27   wherein, in response to the data recovery request, the storage controller selects

28   one of ~~either~~ the first or second snapshot based on the first information, the second information,

29   and the marker information, and selects at least one of the journal entries corresponding to the

30   write operation conducted between the third point in time and one of the first or second point in

31   time associated with the selected snapshot, based on one of[[:]] the first or second information

32   associated with the selected snapshot, the time ordering information and the marker information

33   to recover data of the portion of the data volume at the third point in time by using

34   the selected snapshot and the selected at least one of the journal entries.

1   32.   (Previously presented): The storage system of claim 31, wherein the time

2   ordering information includes time information and/or sequence number.

1   33.   (Previously presented): The storage system of claim 32, wherein the first

2   and second information include time information and/or sequence number.

1   34.   (Previously presented): The storage system of claim 33, wherein the

2   marker information include time information and/or sequence number.

1   35.   (Previously presented): The storage system of claim 31, wherein the write

2   data stored in the journal storing area are stored in chronological order.

1   36.   (Previously presented): The storage system of claim 31, wherein the

2   snapshot storing area and/or the journal storing area are configured with storage volumes.

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1   37.   (Previously presented): The storage system of claim 31, wherein at least

2 one of the journal entries are stored in the journal storing area before storing one of the plurality

3 of snapshots in the snapshot storing area.

1   38.   (Previously presented): The storage system of claim 31, wherein the

2 journal operations are started prior to starting the snapshot operations.

1   39.   (Previously presented): The storage system of claim 31, wherein the

2 selected snapshot is closest in time to the third point in time.

1   40.   (Previously presented): The storage system of claim 31, wherein the

2 selected snapshot is prior in time to the third point in time.

1   41.   (Previously presented): The storage system of claim 31, wherein when

2 receiving a data recovery request with target time between the first point in time and the second

3 point in time, the storage controller selects one of the first or second snapshot based on the first

4 information, the second information, and the target time, and selects at least one of the journal

5 entries corresponding to the write operation conducted between the target time and one of the

6 first or second point in time associated with the selected snapshot based on one of the first or

7 second information associated with the selected snapshot, the time ordering information and the

8 target time to recover data of the portion of the data volume at the target time by using the

9 selected snapshot and the selected at least one of the journal entries.

1   42.   (Previously presented): A storage system coupled to a host computer via

2 a network comprising:

3   a data volume storing write data from the host computer;

4   a snapshot storing area storing a first snapshot of at least a portion of the data

5 volume for a first point in time, the first point in time represented by first information that

6 specifies a time when the first snapshot is taken, the snapshot storing area further storing a

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PAGE 7/10 * RCVD AT 3/28/2006 6:15:10 PM [Eastern Standard Time] * SVR:USPTO-EFXRF-6/43 * DNIS:2738300 * CSID:6503262422 * DURATION (mm-ss):02-48

7   second snapshot of the portion of the data volume for a second point in time, the second point in

8   time represented by second information that specifies a time when the second snapshot is taken;

9   a journal storing area storing journal entries and.marker information, wherein the

10   journal entries comprises the write data and sequence numbers that specifies write ordering to the

11   data volume; and

12   a storage controller conducting write operations according to write requests from

13   the host computer, managing snapshot operations to store a plurality of snapshots including the

14   first snapshot and the second snapshot, and managing journal operations to record the journal

15   entries and record the marker information based on an instruction from the host computer;

16   wherein the sequence number is associated with the first information, the second

17   information, and the marker information;

18   wherein the storage controller releases at least one of the stored journal entries,

19   wherein when receiving a data recovery request that includes the marker

20   information between the first point in time and the second point in time, the storage controller

21   determines if at least one of the journal entries is stored in the journal storing area to perform the

22   data recovery request, selects one of the first or second snapshot based on the first information,

23   the second information and the marker information to copy the selected snapshot to a recovery

24   volume, and selects at least one of the journal entries based on one of the first or second

25   information associated with the selected snapshot, the sequence number and the marker

26   information to recover data of the portion of the data volume by applying the selected journal

27   entries to the copied snapshot in the recovery volume.

1   43.   (Previously presented): The storage system of claim 42, wherein when

2   receiving a data recovery request with a first target time between the first point in time and the

3   second point in time, the storage controller selects one of the first or second snapshot based on

4   the first information, the second information and the first target time to copy the selected

5   snapshot to a recovery volume, and selects at least one of the journal entries based on.one of the

6   first or second information associated with the selected snapshot, the sequence number and the

7   first target time to recover data of the portion of the data volume at the first target time by

8   applying the selected journal entries to the copied snapshot in the recovery volume.

1   44.   (Previously presented): The storage system of claim 42, wherein when

2   receiving a data recovery request with a second target time between the first point in time and the

3   second point in time, the storage controller selects one of the first or second snapshot based on

4   the first information, the second information and the second target time to copy the selected

5   snapshot to a recovery volume, and selects at least one of the journal entries based on one of the

6   first or second information associated with the selected snapshot, the sequence number and the

7   second target time to recover data of the portion of the data volume at the second target time by

8   applying the selected journal entries to the selected snapshot in the recovery volume.

1   45.   (Previously presented): The storage system of claim 42, wherein the write

2   data stored in the journal storing area are stored in chronological order.

1   46.   (Previously presented): The storage system of claim 42, wherein the

2   snapshot storing area and/or the journal storing area are configured with storage volumes.